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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
CHANG, AUDREY Y

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 05/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/650,940	ROH, JAE-WOO	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 March 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on **March 6, 2006** has been entered.

2. This Office Action is also in response to applicant's amendment filed on March 6, 2006, which has been entered into the file.

3. By this amendment, the applicant has amended claims 1, 2, 7 and 8 and has newly added claims 10-11.

4. Claims 1-11 remain pending in this application.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. **Claims 1-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.** The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification and the claims fail to teach how could it be possible that by simply having a lens with a plurality of incident locations for the reduced reference beam will make the refract the reduced beam with different refracted angle toward the storage medium. Every single lens has a plurality of

incident locations for a light beam does this mean by having the lens the light beam will automatically be refracted to the recording medium at different refracted angle? If so this feature will be inherently met by all the lens and all the reference beam passing through a lens. The claims seem to lack a **critical element** for first sending the light beam to different incident location. Without this critical element, the intended features will not be able to achieve.

Claim Objections

7. Claims 1-11 are objected to because of the following informalities:

(1) **Claim 1 has been amended** to include the feature of "a reducing reference beam providing means for transmitting a reduced portion of the reference beam" that is confusing and indefinite since it is not clear what is being reduced here? It is not clear if the intensity, the size or any other features of the reference beam is being "reduced" here. Also the amended phrase "with a satisfied angular sensitivity" recited in claim 1 is confusing and indefinite since it is not clear by what standard is the "satisfaction" is being determined and it is not clear the "angular sensitivity" is referred to what? The refractive angle of the lens certainly does not need any kind of "angular sensitivity".

(2). The phrase "the selected portion of the reference beam" recited in claim 2 is indefinite since it lacks proper antecedent basis from its based claim.

(3). The phrase "a control method" recited in claims 7 and 8 that is confusing and indefinite since it is not clear what is being control here? The steps of the method are drawn more to a method for recording the hologram.

(4). The phrase "reference beam" recited in claims 7 and 8 is confusing and indefinite since it is not clear if it is referred to the reference beam or the reduced reference beam recited in their respective based claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-2, 7-9 and newly added claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent application publication by Goulanian et al (US 2005/0122549 A1) in view of the patent issued to Tanaka et al (PN. 6,256,281).

Goulanian et al teaches a *volume holographic data storage system* that is comprised of a *light source* (60, Figures 7 and 8) for generating a *laser beam*, a *beam splitter* (64) for splitting the laser beam into a *signal beam* (40) and a *reference beam* (74), a *spatial light modulator* (65) for modulating the *signal bean* into pixel data based on data inputted from the outside, a *beam selecting means* (83) for transmitting one of selected portions of the reference beam to thereby produce a *reduced reference beam*, a *lens* (such as 85 or 88) for *refracting* the reduced reference beam into a *storage medium* (50) and a *deflector* serves as the *reflecting means* (86) for reflecting the reduced reference beam received from the beam selecting means toward an incident location on the lens (88, please see Figures 7 and 8). Goulanian et al teaches that the beam selecting means is a *two-dimensional diaphragm or iris* (83 or 67, paragraph [0195]) that is driven by an actuator (84) so that the *size* of the reference beam can be *changed* and the reference beam can be *parallel shifted* with respect to *itself* and the *axis of the lens* (88), (please see paragraph [0198]), this means the *incident locations* of the reduced reference beams formed by selecting different portions of the reference beam (74) on the lens (88) are different from each other. The reduced reference beams having different beam specifics, (such as beam size and parallel shifted position

and incident angles and locations on the recording medium), are used to record *corresponding data,* prepared by the computer (48) and inputted into the spatial light modulator, that are used to modulate the signal beam, (please see paragraph [0198] to [0199]). It is implicitly true that the reference beams having different specifics, including different incident angle separation, would make the holographic recordings of different data represented by the signal beams *separated* from each other so that the cross talk between the recorded holographic data is reduced.

Claim 1 has been amended to include the feature that the lens has a plurality of incident location for the reduced reference beam to be refracted toward the storage medium such that the incident location are spaced apart from each other to yield different refracted angle toward the storage medium. It is implicitly true that a lens having finite extend has a plurality of incident locations and due to the curved nature of the lens contour the lens will refract the incident light beam at different incident locations at different refracted angle, (please see Figure 8). The angular sensitivity recited in claim 1 is not well defined it can only be examined in the broadest interpretation. It appears the angular sensitivity for either the recording medium or the lens are satisfied by the recording arrangement of Goulanian et al.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the data intended to be recorded are *digital* data that are represented as binary pixel data on the spatial light modulator and it does not teach *explicitly* that the data being recorded are arranged in a *page-by-page format*. However **Goulanian** et al does teach that the data is inputted to the spatial light modulator and represented by the pixels of the spatial light modulator to modulate the signal beam which implicitly suggest that the data is represented one pixel-arrangement at a time, which is essentially of page-by-page format. **Tanaka** et al in the same field of endeavor teaches a volume holographic storage system wherein *digital* data is intended to be recorded. Tanaka et al specifically teaches that digital data are represented by *a* spatial light modulator (8) that is controlled by a controller (30) for modulating the signal light beam to make the digital data capable to be recorded as holographic data. The digital data is

represented as binary coding on a page by page basis to be imparted on the signal beam (please see column 7 lines 52-64). Tanaka et al also teaches that the different reference beams with different incident angles and locations on the recording medium are used for recording different page of the data, (please see Figure 1). It would then have been obvious to one skilled in the art to apply the teachings of **Tanaka** et al to modify the system of **Goulanian** et al to inputted digital data to the spatial light modulator to make it capable of recording digital data for the benefit of expanding the utility of the holographic storage system.

With regard to claim 2, Goulanian et al teaches specifically that the beam selecting means is a two-dimensional diaphragm or iris (83 or 67, paragraph [0195]) that is driven by an actuator (84) so that the *size* of the reference beam can be *changed* and the reference beam can be *parallel shifted* with respect to *itself* and the *axis of the lens* (88). This means the two dimensional iris is driven on a two-dimensional plane to provide the parallel shift therefore changing the incident location.

With regard to claims 7 and 8, the method for recording a holographic data is implicitly included by the system disclosure of Goulanian et al. Goulanian et al teaches that locations of the deflector or reflecting means (86) may also be changed by the actuator (87) and the direction of the signal beam may also be changed by using a movable deflector (70) that is driven by an actuator (71, Figure 7). It is implicitly true that during the holographic recording process both the position of the deflector or reflecting means and therefore the incident positions of the reference beam onto the recording medium and the reduced reference beam generated by the selecting means are changed so that different interference patterns between the reduced reference beam and the signal beam can be recorded in a systematic fashion and the holograms or the interference patterns are recoded in a spatially and angularly multiplexed fashion. The order of changing the reflecting means and changing the reduced reference beam does not change the result to the holograms being recorded.

With regard to claim 9, Goulanian et al teaches that the beam selecting means is a two-dimensional diaphragm or iris which has *transparent center region* and *non-transparent periphery region*. Although this reference does not teach explicitly that transparent center region is of a circular shape however it is either implicitly included in the disclosure or an obvious modification to one skilled in the art to make the reduced reference beam with circular beam shape.

With regard to claim 10, Goulanian et al teaches the laser light source comprises a beam expander, (63, Figure 8).

With regard to claim 11, Goulanian et al teaches a *two-dimensional diaphragm or iris* (83) as a beam selecting means for producing the reduced reference beam and a deflector (86) as the reflecting means for reflecting the reduced reference beam.

10. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent application publication by Goulanian et al and the patent issued to Tanaka et al as applied to claim 2 above, and further in view of the patent issued to Hays et al (PN. 5,777,760).

The volume holographic memory system taught by **Goulanian** et al in combination with the teachings of **Tanaka** et al as described for claims 1 and 2 above have met all the limitations of the claims.

With regard to claims 3-4, Goulanian et al teaches to use a two-dimensional deflector (86) serves as the reflecting means (86) that is driven by an actuator (87) to reflect the reduced reference beam to the lens which serves as the second reflection mirror. This reference however does not teach explicitly to use an additional reflecting mirror (as the first mirror). But using reflecting mirror as means to redirect light beam is a common practice in the art. **Hays et al** (Figure 10) teaches an arrangement of using a first and second reflecting mirror (33 and 35) with an actuator (41) to control the position of the second mirror (33) to direct the reference beam toward the lens (37). It would then have been obvious to one skilled in the art to apply the teachings of **Hays** et al as an alternative arrangement for the hologram memory system for

the benefit of have more direction control of the reference beam. It is an obvious modification to one skilled in the art to make the incident direction of the reference beam on the lens to be the same for the benefit of maintaining the incident direction of the reference beam on the recording medium. With regard to claim 6, although these references do not teach explicitly to have an actuator to control the position of the first mirror, such modifications would have been obvious to one skilled in the art for the benefit of adding add ional control to the direction of the reference beam.

11. Claims 1, 7, and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Blaum et al (PN. 5,727,226) in view of the patent issued to Klug et al (PN. 6,330,088).

Blaum et al teaches a volume holographic digital storage system that is comprised of a *light generator* including a *laser light source* (20, Figure 2) for generating a laser beam, a *beam splitter* (24) for splitting the laser beam into a *signal beam* (28) and a *reference beam* (26), and a *spatial light modulator* (30) for modulating the signal beam to contain binary pixel data on a page-by-page basis based on the data inputted from the outside, (please see the binary page data as shown in Figures 8 and 9). Blaum et al further teaches that the storage system comprises a mirror for reflecting reference beam to a beam multiplexer (40) for conditioning the reference beam to incident on the recording medium (10) at different incident angle to interfere with the signal beam modulated with different page of the data to provide angular multiplexing recording of the hologram wherein the angular multiplexing recording implicitly satisfies the angular sensitivity of the medium to reduce cross talk of the recording for different page of the data.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly to include a reduced reference beam providing means and a lens. Klug et al in the same field of endeavor teaches a reference beam steering means (400, Figures 8 and 14) that is comprised of an

aperture (430, Figure 14) for reducing the beam waist of the reference beam (25), a beam steering system (450) for receiving the reduced reference beam and a lens (410 or 405) having a plurality of incident locations (the incident locations are along the surface of the lens) inherently separated from each other that will refract the reduced reference beam at different refract angle toward the hologram recording medium (110). It would then have been obvious to one skilled in the art to apply the teachings of Klug et al to modify the multiplexer of Blaum et al for the benefit of providing beam size control and explicitly beam steering arrangement to steer the reference beam to the recording medium with more control.

With regard to newly added claim 11, Klug et al teaches the aperture (430) serves as the beam selecting means and the beam steering system (450) serves as the reflecting means for reflecting the reduced reference beam toward one of the incident locations of the lens.

With regard to claim 7, Blaum et al in view of Klug et al teach that the hologram is recorded by moving the reflecting means to record different page data of the signal beam with the reference beam incident on the recording medium at different angle (i.e. angular multiplexing). The interference patterns between the reference and signal beams is the recorded hologram.

With regard to claim 10, Blaum et al teaches the light source generation means includes a laser light source (20) and a beam shaping means (22) that includes a beam expander, (please see column 5, lines 45-50).

12. **Claims 2-6 and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over patents issued to Blaum et al and Klug et al as applied to claim 1 above, and further in view of the patent application publication by Goulanian et al (US 2005/0122549 A1).**

The volume holographic digital storage system taught by Blaum et al in view of the patent issued to Klug et al as described for claim 1 above have met all the limitations of the claims.

With regard to claim 2, these references however do not teach explicitly to use an actuator to move the location of the aperture. Goulanian et al in the same field of endeavor teaches to use abeam selecting means comprises a two-dimensional diaphragm or iris (83 or 67, paragraph [0195]) that is driven by an actuator (84) so that both the *size* and the location of the reference beam can be *changed* with respect to *itself* and the *axis of the lens* (88). It would then have been obvious to one skilled in the art to apply the teachings of Goulanian et al to use an actuator to drive the aperture so that the reference beam can be further steered by changing the location of the aperture. **With regard to claim 8,** the steering of the reference beam then is alternatively done by the movement of the aperture or iris for the recording of the hologram.

With regard to claims 3-6, Klug et al teaches that an actuator is used to adjust the position of the reflecting mirror (460, Figure 15) in the beam steering system (450). Although this reference does not teach to use a second reflecting mirror, however it is really a common practice in the art to use reflecting mirror to fold the light beam as desired to direct the light beam to desired location. The feature concerning another actuator is considered to be obvious modification to one skilled in the art since it is implicitly true that the orientation of the reflecting means needed to be adjusted and oriented properly to properly steer the reference beam to the desired location and to use hand or any other actuator means would have been obvious to one skilled in the art to achieve the proper orientation.

With regard to claim 9, the aperture in general has a circular transparent shape in the center.

Response to Arguments

13. Applicant's arguments filed on March 6, 2006 have been fully considered but they are not persuasive.

14. In response to applicant's arguments which state the present invention is related to "a holographic digital data storage system which records a plurality of holographic pages in a same spatial location by reduction the size of a reference bream and changing an angle of incidence of the reference beam on a

storage medium" which differs from the cited references, the examiner respectfully disagrees since these features are NOT in the claims and therefore cannot be relied upon to overcome the rejections.

The applicant is respectfully noted that the type of the signal information provided by the spatial light modulator whether to be digital or 3D object information, *does not* differentiate the recording hardware arrangement since the only difference is to have *different type* of information being displayed on the spatial light modulator. A spatial light modulator such as LCD display certainly can display any type of image information.

Applicant's arguments concerning the angle of incidence of the reference beam of the cited Goulanian et al reference is maintained constant which therefore differs from the instant application the examiner respectfully disagrees for the reasons stated below. It is not true that the angle of the incidence of the reference beam on the recording medium will be constant since the reflector (86) would deflect the direction of the reference beam cause the angle of incidence to change. Secondly the claims *never* claim anything concerning the incident angle of the reference beam on the recording medium the feature therefore cannot be relied upon to overcome the rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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